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ABSTRACT

E. Boder and S. Jarrico have developed a test designed to measure the cognitive deficits underlying reading disabilities, which they claim will identify two basic reader subtypes: those with deficits in auditory-linguistic processing skills (dysphonetic) and those with the inability to process visual-spatial information (dyseidetic). To examine the validity of the measure, 28 reading disabled and 20 average readers between 7 and 13 years of age completed Boder and Jarrico measures that gauged visual-spatial ability and knowledge of letter-sound correspondence and two other measures of the same functions. Regression analysis was used to determine the pattern of relationships between performance on the Boder and Jarrico test and on the other two measures. Results indicated that the Boder and Jarrico test should be used with caution. While the measure was sensitive to auditory-linguistic processing, it was not to visual-spatial processing, and thus provided information on only one type of disabled reader. In addition, the age related increase in subjects' production of phonetic spellings suggested that older readers would tend to be classified as dyseidetic, while younger subjects would be classified as dysphonetic. (FL)

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Cognitive Correlates of Reading and Spelling Patterns: An Analysis of Boder's Method of Subtyping Disabled Readers

(Summary Report)

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COGNITIVE CORRELATES OF READING AND SPELLING PATTERNS: AN ANALYSIS OF BODER'S METHOD OF SUBTYPING DISABLED READERS

I. INTRODUCTION

One of the more widely accepted views in the current literature is that there are two general subcategories of reading disability. In this view (Myklebust, 1965; Boder, 1971), some reading difficulties are due to deficits in auditory-linguistic processing skills, while others are caused by an inability to process visual-spatial information. It is also suggested that readers in these subtyping categories present very different types of reading difficulties. For example, those in the auditory-linguistic group find it difficult to analyze a word into its constituent phonemes. This difficulty would be especially apparent when unfamiliar words were presented because the reader would not have the requisite skills to break down the word into its pronounceable components. An individual with this type of reading problem could learn to read only by associating the sound of the whole word with its visual representation. In this paper this method of reading will be referred to as the "whole word" or "visual" approach.

In contrast, the reader with a visually based reading problem would have little difficulty learning new words, since phonic skills would be adequate. Instead, this reader's problem would appear as an inability to read

fluently. In the absence of good visual memory skills, words could be read only by means of phonic analysis, and thus, word decoding would not become sufficiently automatic to achieve the fluency which characterizes the mature reader. We will refer to this method of reading as the "phonic" or "auditory-linguistic" approach.

A logical extension of subtyping is that the method of remediation must be geared to the type of reading problem presented. Thus, some theorists advocate using tactile approaches to compensate for deficient visual memory skills, or a remedial phonics program to help those with deficient phonics. For this individualized approach to be implemented, there must be reliable methods available to identify each of the subtypes. While a number of identification approaches have been reported in the research literature (Mattis, French and Rapin, 1976; Satz and Morris, 1981), none of them can be readily applied in the clinical setting because they involve the administration of a large number of tests, and/or require complex statistical manipulations of the data.

Boder and Jarrico (1982) have recently published a test, based on earlier work (Boder, 1971, 1973), which is designed to assess the cognitive deficits underlying reading disabilities. Unlike other current subtyping methodologies, this test has been designed for use in the clinical setting.

Boder and Jarrico claim that the two basic reader subtypes described above (with several variants) may be derived from this test: a reading disability related to an auditory-linguistic deficit (which Boder and Jarrico call the dysphonetic subtype), and a reading disability related to a visual-spatial deficit (which they label the dyseidetic subtype). In this method, subtyping is achieved by analysis of three measures of reading and spelling performance which are presumably sensitive to the visual-spatial and verbal deficits found in the subtypes. The focus of the present investigation was to examine the validity of the inferences derived from the Boder and Jarrico reading and spelling measures.

A. Description of the Boder and Jarrico Subtyping Procedures

The three measures used to classify readers into subtypes are: a sight word reading test, a test of the ability to spell words in the sight vocabulary, and a test of the ability to spell words not in the sight vocabulary.

In the sight word reading test, a series of graded word lists is presented and the highest level word list in which 50% of the words can be read determines the reading grade. In establishing a reading grade, credit is given only to those words read within one second of presentation. Boder and Jarrico maintain that this time limit precludes the use of phonic analysis and thus the sight word test

provides a measure of the ability to use the whole word or visual approach to reading.

After the sight word reading test has been completed, the examiner selects 10 words which were read correctly (5 phonetically regular and 5 phonetically irregular), and the examinee attempts to spell them. According to Boder and Jarrico, the percentage of these words correctly spelled also provides an index of visual memory skills ("the ability to revisualize words in the sight vocabulary"). The test criteria specify that dysphonetics and dyseidetics can spell 50% of fewer of these words correctly, whereas normal readers can spell more than 50% of them.

Finally, the examinee is required to spell words not in the sight vocabulary; i.e., words not read on the sight word reading test. For this test, credit is given for spellings which are phonetically accurate renditions (good phonetic equivalents) of the words presented. For example, credit would be given if the word "flight" was spelled "flite" or if "caught" was spelled "cot". The ability to produce such phonetic reproductions is the skill which distinguishes the two basic subtypes; i.e., readers in the auditory-linguistic subtype (dysphonetics) produce 50% or fewer phonetic representations in their spelling productions, whereas those in the visual subtype (dyseidetics) produce more than 50%.

B. Literature Review

Most previous studies which have investigated the validity of the Boder subtyping measures have focused on the cognitive abilities of the two major Boder subtypes: dysphonetics and dyseidetics. The theory underlying this subtyping methodology makes straightforward predictions regarding the performance of these groups: dysphonetics should have difficulty on tasks which involve the processing of verbal information; dyseidetics should be impaired on visual-spatial tasks.

The evidence supporting deficient verbal skills in dysphonetics is quite consistent across studies. For example, it has been found that dysphonetics have significantly lower WISC-R verbal than performance scores (Ginn, 1979). Other studies (Menken, 1981; Malatesha, 1981) have confirmed the existence of a verbal deficit in dysphonetics.

If there is a visual-spatial deficit in dyseidetics, then one would expect to find lower performance than verbal WISC-R scores. However, the only two studies reporting such data (Ginn 1979; Dalby and Gibson, 1981) found no difference between the WISC-R verbal and and performance scores. Other data presented by Dalby and Gibson (1981), and Fried, Tanguay, Boder, Doubleday and Greensite (1981) were inconsistent with the notion of a visual-spatial deficit in dyseidetics. The only positive instance of

deficient visual-spatial skills in dyseidetics was Aaron's (1978) finding that dyseidetics were inferior to dysphonetics and normals on a face recognition task.

To summarize, the evidence reviewed suggests that dysphonetics are deficient in several types of verbal ability. Other than Aaron's face recognition data, there is no evidence to suggest that dyseidetics have a visual-spatial deficit.

II. THE PRESENT STUDY

The lack of evidence for a visual-spatial deficit in dyseidetics pointed to a need to clarify the inferences which could be derived from the Boder and Jarrico subtyping measures. Rather than study the characteristics of the subtypes, as has been done in most previous work, the approach taken in the present study was to investigate the significance of the measures themselves.

The present work began with the assumption made by Boder and Jarrico that there are two basic subtypes: one auditory-linguistic, the other visual-spatial. If the Boder and Jarrico methodology is to be of use, then it would seem important to establish that it can provide information on these two types of readers. The basic approach taken was to compare the measures used by Boder and Jarrico with other measures of auditory-linguistic processing and visual-spatial ability.

A. Subjects: Forty-eight subjects between the ages of 7 and 13 years were tested. Of these, 28 were disabled readers and 20 were average readers. The disabled readers were children of average intelligence who had been referred to the Learning Centre for a specific learning disability in the area of reading. The average readers were drawn from regular grade 3-6 classrooms in the Calgary Board of Education. They were selected on the basis of a teacher report of no delay in reading. The mean reading age of the

average readers (11.16 years, s.d.=2.5) was approximately 2 years above chronological age (9.1 years, s.d.=2.5), whereas the reading age of the disabled readers (mean=8.58 years, s.d.=2.6) was approximately two years below their chronological age (10.8 years, s.d.=1.9).

B. Procedure: The validity of the Boder and Jarrico subtyping methodology hinges on its ability to measure two reading-related functions: visual-spatial ability and knowledge of letter-sound correspondences. To make this assessment, the Boder and Jarrico measures were compared with two other measures of these same functions. The latter two measures were derived from a task described by Samuels, Hiscock and Kinsbourne (1978). In this task two types of memory performance were contrasted: memory for spatial-position and memory for letter names.

C. Experimental Questions and Results

Two of the measures used by Boder and Jarrico supposedly require the utilization of visual-memory skills. The sight word reading test, described by Boder and Jarrico as an index of the ability to read words as whole visual patterns, should require the utilization of visual-memory skills, as should the sight word spelling test, which is described as a measure of the ability to revisualize words in the sight vocabulary. It was therefore hypothesized that both of these measures would be more closely related

to the measure of memory for spatial position, than to the measure of memory for letter names.

A multiple regression analysis was used to determine the pattern of relationships between the two memory tasks and performance on the Boder and Jarrico criterion tests. The results of this analysis did not support the proposed hypothesis. Instead, only memory for letter names was significantly related to both of the Boder and Jarrico criterion measures.

On the spelling test which utilizes words not in the sight vocabulary, the examinee is given credit only if his production is a phonetically accurate rendition of the word. Boder and Jarrico maintain that this task provides an index of knowledge of phonics. It was therefore hypothesized that performance on this task would be more closely related to memory for letter names, than to memory for spatial position.

As hypothesized, the regression analysis indicated that the ability to produce phonetically accurate spellings was related to memory for letter names, but not to memory for spatial position.

The final question concerned ways in which the age and experience of the examinees might affect the outcome of the Boder and Jarrico subtyping methodology. Specifically, this question was concerned with the scores derived from the ability to spell words in the sight vocabulary and

words not in the sight vocabulary, both of which are expressed as simple percentages. For example, a reader with a below average sight word vocabulary, who spelled 50% or fewer words in the sight vocabulary, and who produced 50% or fewer phonetically accuarate spellings of words not in the sight vocabulary, would be classified as dysphonetic. A reader with exactly the same profile but who produced more than 50% phonetically accurate spellings, would be classified dyseidetic. If there were an age-related trend to produce more phonetic spellings, then there would also be a tendency for older readers to be classified as dyseidetic. This prediction was verified in two ways. First, it was found that there was a significant positive relationship between age and the production of phonetic spellings. Second, older examinee's produced significantly more phonetic spellings than younger examinee's, even though the older readers were just as disabled as younger readers.

III. DISCUSSION

In the present study the cognitive significance of the Boder and Jarrico criterion measures was assessed with respect to auditory-linguistic and visual-spatial functions. Memory for letter names was used as the measure of auditory-linguistic processing, whereas memory for spatial position was used as the measure of visual-spatial skill. The results of the present study indicated that all three Boder and Jarrico criterion measures were significantly related to memory for letter names, but not to memory for spatial position. The implication of this finding is that the Boder and Jarrico methodology is not an effective instrument in diagnosing reading problems related to visual-spatial deficit. The lack of sensitivity of the test procedures to visual-spatial skill may explain why other studies have failed to document visual-spatial deficit in dyseidetics: If the measures which are used to define dyseidetics are not sensitive to visual-spatial skill, then it is not surprising that a visual-spatial deficit has not been consistently documented in dyseidetics. However, it should be noted that the conclusions to be drawn are limited by the fact that only one measure of visual-spatial ability was used. It may be that there is some other measure of visual-spatial skill which would have led to different conclusions.

The results of the present study indicated that all

three Boder and Jarrico criterion measures were sensitive to auditory-linguistic processing as indexed by memory for letter names. This finding is also consistent with other studies which have shown that the Boder and Jarrico methodology is quite accurate in identifying readers with auditory- linguistic deficits.

The other major question was concerned with the possibility of an age-related bias in the way examinee's are classified into subtypes. In this regard it was found that there was an age-related increase in phonetic spellings. Since, by definition, dyseidetics produce more phonetic spellings than dysphonetics, this finding implies that older children would be more likely to be classified as dyseidetic, and younger children as dysphonetic.

To summarize, these findings suggest that the Boder and Jarrico methodology must be used with great caution at the present time. On the positive side, the present work suggests that the procedures used by Boder and Jarrico may be useful in determining reading problems related to auditory-linguistic processing. In fact, all of the criterion measures used were significantly related to the measure of auditory-linguistic processing (i.e., memory for letter names).

However, two findings lead one to question the use of the test as a subtyping instrument. First, the present data (and several previous studies) suggest that the

measures employed in this test are sensitive to auditory-linguistic processing, not to visual-spatial ability, and therefore it can only provide information on one type of disabled reader. Second, the age-related increase in examinee's production of phonetic spellings, suggests that older readers would tend to be classified in the visual-spatial (dysphonetic) subtype.

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